

The fish fauna of the streams and ponds in the Pilis, Visegrádi and Börzsöny Mountains, Hungary – a review of the scientific literature

By
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Abstract. This paper summarises the ichthyological research on the small streams and ponds of the Danube Bend region. Based on the scientific literature the presently known fish fauna is listed and evaluated together with the human impacts responsible for fish fauna changes. The necessity of regional fish community monitoring is emphasised.

The calcareous Pilis- (757 m), and the volcanic Visegrádi- (700 m) and Börzsöny (939 m) Mountains are situated along a scenic bend of the River Danube, to the north of Budapest (Fig. 1). The so-called Danube Bend region is of high priority from a nature conservation viewpoint. Belonging to the management of the Danube-Ipoly National Park, the area has been functioning also as a UNESCO MAB Biosphere Reserve („Pilis Biosphere Reserve“) since 1981 (Berczik, 1984). The aim of the present paper is to summarise the ichthyological knowledge on the region with special regard to faunistic data, on the basis of the scientific literature.

Chronological review of fish biological research

Table 1 shows the published scientific papers in chronological order with an indication of the examined waters. Among streams, mainly mountain streams with permanent flow have been studied so far. As regards lowland streams belonging to the region, only the fish fauna of the Lókos Stream, Ilka Stream, Sződrákos Stream, and its tributaries have been examined. Besides watercourses, additional data exist on a few standing water bodies, namely the pond of Pannóniatelep at Szentendre, the pond of Göd (Fenecketlen Pond), and the fish pond system of Veresegyház. The fish fauna of a special habitat, the peat pit at Göd and its overflow is also known.

Research was carried out with a wide range of aims in the area. Mihályi (1954) and Berinkey (1972) reviewed the fish material of the Natural History Museum of Hungary and provided data on some streams of the Visegrádi and

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Table 1. List of small water bodies in the Visegrádi and Büszöny Mountains examined for ichthyological purposes
(The name of each watercourse or standing water body is followed by the name of the nearest town, in parentheses. The letters following the town names are as follows:
V: stream in the Visegrádi Mountains, B: stream in the Büszöny Mountains, S: lowland stream or pond)

Authors		Streams and ponds on the right bank of the Danube	Streams and ponds on the left bank of the Danube	Streams of the Ipoly water basin
Mihályi, 1954 Jászfaulusi, 1950 a, b Borányi, 1972 Botta et al., 1981, 1984 Keresztesi, 1992, 1993 a, b, c, 1994, 1995 Erdős, 1997, 1998 a, b, c Sallai, 1997	+	Apátkúti Stream (Visegrád) V		
	+	Bükkös Stream (Szentendre) V		
	+	Lepence Stream (Visegrád) V		
	+	Malom Stream (Dömös) V		
	+	Pond of Pannóniatelep (Szentendre) L		
	+	Pilismaróti Stream (Pilismarót) V		
	+	Bőszobi Stream (Zebegény) B		
	+	Fenecketlen Pond (Göd) L		
	+	Ilka Stream (Göd) L		
	+	Keskenybükk Stream (Szendehegy) B		
	+	Lesvölgyi Stream (Verőce) B		
	+	Lókos Stream (Diósjénő) L		
	+	Malomvölgyi Stream (Zebegény) B		
	+	Morgó Stream (Kismaros) B		
	+	Sződrákos Stream (Sződliget) L		
	+	Tece Stream (Sződ) L		
	+	Peat pit and overflow (Göd) L		
	+	Fish pond system of Veresegyház (Veresegyház) L		
	+	Verőce Stream (Verőce) B		
	+	Zlebi Stream (Szokolyahuta) B		
	+	Bernecei Stream (Bernecebarát) B		
	+	Csarna Stream (Kemence) B		
	+	Kemence Stream (Kemence) B		
	+	Rózsa Stream (Kemence) B		

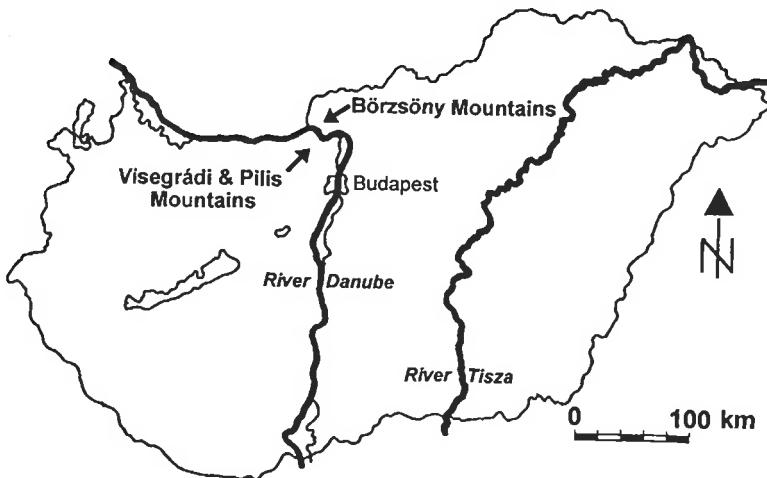


Fig. 1. The location of the Pilis-, Visegrádi- and Börzsöny Mountains in Hungary

Börzsöny Mountains. Jászfalusi (1950 a, b) investigated the hydrobiological state of some streams and lakes making suggestions for their management. Botta *et al.* (1981, 1984), Keresztessy (1992, 1993 a, b, c, 1994, 1995), Erős (1998 a) and Sallai (1997) made faunistic surveys, while Erős (1997, 1998 b, c) also provided some data on the ecology of two streams in the Visegrádi Mountains.

The presently known fish fauna

Altogether 39 fish species were recorded from the streams and ponds of this part of Hungary (Table 2), half of the presently known Hungarian fish fauna. Of the 39 species 12 are protected, 1 is strictly protected. Regarding the nature conservation status of fishes in Hungary (Guti, 1993), the fish fauna of this region comprises 8 vulnerable, 13 rare, 13 abundant, 4 introduced and 1 immigrant species. The distribution of fish according to their nature conservation status is presented in Table 3, in three categories (streams of the Visegrádi Mountains, streams of the Börzsöny Mountains, lowland streams and standing water bodies).

Table 2. Fish fauna list of small water bodies in the Danube Bend region, based on the scientific literature.

CS: Conservation status (V: vulnerable, R: rare, A: abundant, Im: immigrant, In: introduced). V: streams of the Visegrádi Mountains, B: streams of the Börzsöny Mountains, L: lowland streams and standing water bodies. Note: the Latin names of protected species are in bold)

Fish species		CS	V	B	L
<i>Abramis brama</i> (Linné, 1758)	Common bream	A	+	-	+
<i>Alburnoides bipunctatus</i> (Bloch, 1782)	Schneider	V	+	+	-
<i>Alburnus alburnus</i> (Linné, 1758)	Bleak	A	+	+	+
<i>Aspius aspius</i> (Linné, 1758)	Asp	R	-	-	+
<i>Barbatula barbatula</i> (Linné, 1758)	Stone loach	R	+	+	+
<i>Barbus barbus</i> (Linné, 1758)	Barbel	A	+	+	+
<i>Barbus peloponnesius petenyi</i> (Heckel, 1758)	Southern barbel	V	+	+	-
<i>Carassius auratus</i> Linné, 1758	Gibel carp	A	+	-	+
<i>Carassius carassius</i> Linné, 1758	Crucian carp	R	-	-	+
<i>Chondrostoma nasus</i> (Linné, 1758)	Nase	R	+	+	+
<i>Cobitis</i> sp. (Linné, 1758)	Spined loach	R	-	+	+
<i>Cyprinus carpio</i> Linné, 1758	Carp	A	-	-	+
<i>Esox lucius</i> Linné, 1758	Pike	A	+	+	+
<i>Gobio albipinnatus</i> Lukasch, 1933	White-finned gudgeon	R	+	+	-
<i>Gobio gobio</i> (Linné, 1758)	Gudgeon	A	+	+	+
<i>Gobio kessleri</i> Dybowski, 1862	Kessler's gudgeon	V	-	+	-
<i>Gymnocephalus cernuus</i> (Linné, 1758)	Ruffe	A	-	-	+
<i>Ictalurus nebulosus</i> (Le Seur, 1819)	Brown bullhead	In	-	-	+
<i>Lepomis gibbosus</i> (Linné, 1758)	Pumpkinseed	In	+	+	+
<i>Leucaspis delineatus</i> (Heckel, 1843)	Sunbleak	V	-	-	+
<i>Leuciscus cephalus</i> (Linné, 1758)	Chub	A	+	+	+
<i>Leuciscus idus</i> (Linné, 1758)	Ide	R	+	-	-
<i>Leuciscus leuciscus</i> (Linné, 1758)	Dace	R	+	+	+
<i>Lota lota</i> (Linné, 1758)	Burbot	R	-	-	+
<i>Misgurnus fossilis</i> (Linné, 1758)	Weatherfish	R	-	-	+
<i>Neogobius kessleri</i> Günther, 1861	Kessler's goby	Im	+	-	-
<i>Oncorhynchus mykiss</i> (Walbaum, 1792)	Rainbow trout	In	+	-	-
<i>Perca fluviatilis</i> Linné, 1758	Perch	A	+	-	+
<i>Phoxinus phoxinus</i> (Linné, 1758)	Minnow	V	+	+	-
<i>Proterorhinus marmoratus</i> (Pallas, 1811)	Monkey goby	R	+	+	+
<i>Pseudorasbora parva</i> (Schlegel, 1842)	False rasbora	In	+	-	+
<i>Rhodeus sericeus</i> (Bloch, 1843)	Bitterling	A	+	+	+
<i>Rutilus rutilus</i> (Linné, 1758)	Roach	A	+	-	+
<i>Salmo trutta m. fario</i> Linné, 1758	Brown trout	R	+	+	-
<i>Scardinius erythrophthalmus</i> (Linné, 1758)	Rudd	A	-	-	+
<i>Tinca tinca</i> (Linné, 1758)	Tench	R	-	-	+
<i>Umbra krameri</i> Walbaum, 1792	Hungarian mudminnow	V	-	-	+
<i>Vimba vimba</i> (Linné, 1758)	Zahrt	V	-	-	+
<i>Zingel streber</i> (Siebold, 1863)	Streber	V	-	+	-

Table 3. Percentage distribution of fish species with different conservational status in the three (V, B, L) water categories.
 (V: streams of the Visegrádi Mountains, B: streams of the Börzsöny Mountains, L: lowland streams and standing water bodies)

	V	B	L
<i>Vulnerable</i>	11.5	26.3	13.8
<i>Rare</i>	34.6	36.8	31
<i>Abundant</i>	38.5	31.6	44.8
<i>Immigrant</i>	3.9	0	0
<i>Introduced</i>	11.5	5.3	10.4

The fauna of the lowland streams and ponds can easily be discriminated from the fauna of the streams of the Visegrádi and Börzsöny Mountains (Table 2). The most frequent fish species of the Visegrádi and Börzsöny Mountains typical also in other montane streams in Hungary are the stone loach, chub, and the gudgeon. Rarer fish species are the minnow, southern barbel, schneider and the dace. In the upper sections of three streams (Apátkúti Stream (V), Morgó Stream (B), Kemence Stream (B)) brown trout can be found probably due to introductions. Other fish species are common exclusively at the mouth of the streams or get into the watercourses from small water reservoirs established for various reasons like sport fishing, basin irrigation or flood control.

The most common fish species of the lowland streams and ponds are the spined loach, bitterling, rudd, Hungarian mudminnow, pike, pumpkenseed, perch, and the tubenose goby. Beside these species, the list contains fish frequent in larger water bodies such as the asp, zahrte, common bream, barbel, burbot, nase; fish showing preference for standing water rich in aquatic vegetation such as the tench, crucian carp, mud loach, sunbleak, roach; fish common also in mountain streams such as the stone loach, chub, gudgeon; and fish introduced and bred in fish ponds such as the carp, gibel carp, false rasbora, and the brown bullhead.

Human impact-induced fish fauna changes

The growth of Budapest and increased tourism in the Danube Bend will have to be taken into account in nature conservation and environment policy in the coming years. Shorelines are preferred recreational target places for tourism. Furthermore, the effects of local pollution caused by settlements, channelisation, concrete dams that obstruct fish movement, the possible

Table 4. List of fish species in the Visegrádi Mountains

Fish species	Berinkey, 1972	Apátkúti Stream	Jászfalusi, 1950b	Berinkey, 1972	Bükös Stream	Lepence S.	Berinkey, 1972	Malom Stream	Fülsmaroti Stream
<i>Abramis brama</i>									
<i>Alburnoides bipunctatus</i>			+						
<i>Alburnus alburnus</i>		+	+	+	+	+			
<i>Barbatula barbatula</i>		+	+	+	+	+			
<i>Barbus barbus</i>			+	+	+	+			
<i>Barbus peloponnesius pet.</i>	+	+	+	+	+	+			
<i>Carassius auratus</i>			+	+	+	+			
<i>Chondrostoma nasus</i>			+	+	+	+			
<i>Esox lucius</i>		+	+	+	+	+			
<i>Gobio albipinnatus</i>				+	+	+			
<i>Gobio gobio</i>	+	+	+	+	+	+			
<i>Lepomis gibbosus</i>				+	+	+			
<i>Leuciscus cephalus</i>	+	+	+	+	+	+			
<i>Leuciscus idus</i>			+	+	+	+			
<i>Leuciscus leuciscus</i>				+					
<i>Neogobius kessleri</i>			+						
<i>Oncorhynchus mykiss</i>		+							
<i>Perca fluviatilis</i>			+						
<i>Phoxinus phoxinus</i>	+	+					+		+
<i>Proterorhinus marmoratus</i>	+	+	+		+				
<i>Pseudorasbora parva</i>			+		+				
<i>Rhodeus sericeus</i>							+		
<i>Rutilus rutilus</i>		+		+	+				
<i>Salmo trutta m. fario</i>	+	+							

impacts of introduced fish species on ecological interactions, and other passive or active human works threaten the natural fish fauna of the region.

The fishes of the examined waters and the gradual changes in the fauna lists from collection to collection are presented in Tables 4, 5, 6.

Owing to sporadic collections and the lack of definite aim of monitoring the long term changes of the fish fauna cannot be followed. Among the reviewed papers only Erős (1998 a) gave some information on human impacts that imperil local fish fauna. Therefore, only in the case of some streams can we draw conclusions regarding the alteration of their biota.

Table 5. List of fish species in the Börzsöny Mountains

Fish species		Börzsöny Stream									
<i>Alburnoides bipunctatus</i>											
<i>Alburnus alburnus</i>											
<i>Barbus barbus</i>											
<i>Barbus peloponnesius petenyi</i>											
<i>Chondrostoma nasus</i>											
<i>Cobitis sp.</i>											
<i>Esox lucius</i>											
<i>Gobio albipinnatus</i>											
<i>Gobio gobio</i>											
<i>Gobio kessleri</i>											
<i>Lepomis gibbosus</i>											
<i>Leuciscus cephalus</i>											
<i>Leuciscus leuciscus</i>											
<i>Phoxinus phoxinus</i>											
<i>Proterorhinus marmoratus</i>											
<i>Rhodeus sericeus</i>											
<i>Salmo trutta m. fario</i>											
<i>Zingel streber</i>											
Kerecsegyi Stream		Kerecsegyi Stream									
<i>Leuciscus leuciscus</i>	Bertriky 1972										
<i>Malomvölgyi Stream</i>	Bertriky 1972										
Mergő Stream		Mergő Stream									
<i>Leuciscus leuciscus</i>	Bertriky 1972										
Mergő Stream		Mergő Stream									
<i>Leuciscus leuciscus</i>	Bertriky 1972										
Mergő Stream		Mergő Stream									
<i>Leuciscus leuciscus</i>	Bertriky 1972										
Mergő Stream		Mergő Stream									
<i>Leuciscus leuciscus</i>	Bertriky 1972										
Mergő Stream		Mergő Stream									
<i>Leuciscus leuciscus</i>	Bertriky 1972										
Mergő Stream		Mergő Stream									
<i>Leuciscus leuciscus</i>	Bertriky 1972										
Mergő Stream		Mergő Stream									
<i>Leuciscus leuciscus</i>	Bertriky 1972										
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<i>Leuciscus leuciscus</i>	Bertriky 1972										
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<i>Leuciscus leuciscus</i>	Bertriky 1972										
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<i>Leuciscus leuciscus</i>	Bertriky 1972										
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<i>Leuciscus leuciscus</i>	Bertriky 1972										
Mergő Stream		Mergő Stream									
<i>Leuciscus leuciscus</i>	Bertriky 1972										
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<i>Leuciscus leuciscus</i>	Bertriky 1972										
Mergő Stream		Mergő Stream									
<i>Leuciscus leuciscus</i>	Bertriky 1972										
Mergő Stream		Mergő Stream									
<i>Leuciscus leuciscus</i>	Bertriky 1972										
Mergő Stream		Mergő Stream									
<i>Leuciscus leuciscus</i>	Bertriky 1972										
Mergő Stream		Mergő Stream									
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<i>Leuciscus leuciscus</i>	Bertriky 1972										
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<i>Leuciscus leuciscus</i>	Bertriky 1972										
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<i>Leuciscus leuciscus</i>	Bertriky 1972										
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<i>Leuciscus leuciscus</i>	Bertriky 1972										
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<i>Leuciscus leuciscus</i>	Bertriky 1972										
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<i>Leuciscus leuciscus</i>	Bertriky 1972										
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<i>Leuciscus leuciscus</i>	Bertriky 1972										
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<i>Leuciscus leuciscus</i>	Bertriky 1972										
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<i>Leuciscus leuciscus</i>	Bertriky 1972										
Mergő Stream		Mergő Stream									
<i>Leuciscus leuciscus</i>	Bertriky 1972										
Mergő Stream		Mergő Stream									
<i>Leuciscus leuciscus</i>	Bertriky 1972										
Mergő Stream		Mergő Stream									
<i>Leuciscus leuciscus</i>	Bertriky 1972										
Mergő Stream		Mergő Stream									

Table 6. List of fish species in the lowland streams and small water bodies

Species	Jászfálus, 1950 b	Jászfálus, 1950b	Ilka Stream	Lőkös Stream	Pond of Pannónia	Jászfálus, 1950b	Szédfákos Stream	Tece Stream	Peat pit (Göd)	Peat pit overflow (Göd)	Veresegyház
	Fenekelelén Pond	Botta et al., 1984	Keresztesy, 1993a	Botta et al., 1981	Keresztesy, 1993a	Botta et al., 1984	Keresztesy, 1995	Botta et al., 1984	Botta et al., 1981	Botta et al., 1984	Keresztesy, 1995
<i>Abramis brama</i>											
<i>Alburnus alburnus</i>											
<i>Aspius aspius</i>											
<i>Barbatula barbatula</i>		+									
<i>Barbus barbus</i>											
<i>Carassius auratus</i>											
<i>Carassius carassius</i>											
<i>Chondrostoma nasus</i>		+									
<i>Cobitis</i> sp.											
<i>Cyprinus carpio</i>											
<i>Esox lucius</i>	+										
<i>Gobio gobio</i>											
<i>Gymnocephalus cernua</i>	+										
<i>Ictalurus nebulosus</i>	+										
<i>Lepomis gibbosus</i>											
<i>Leucaspis delineatus</i>											
<i>Leuciscus cephalus</i>											
<i>Leuciscus leuciscus</i>											
<i>Lota lota</i>											
<i>Misgurnus fossilis</i>											
<i>Perca fluviatilis</i>											
<i>Proterorhinus marmoratus</i>											
<i>Pseudorasbora parva</i>											
<i>Rhodeus sericeus</i>											
<i>Rutilus rutilus</i>											
<i>Scardinius erythrophthalmus</i>											
<i>Tinca tinca</i>											
<i>Umbra krameri</i>											
<i>Vimba vimba</i>											

From the streams of the Visegrádi Mountains, the fish fauna of the Bükkös and the Apátkúti streams became richer. This increase in species number is certainly the result of more intensive collections and sampling methods and not the improvement of the biological integrity of the streams. The Apátkúti Stream showed the most diverse fish fauna. However, because of a dam and the possible competitive and predatory effect of brown trout, all the other fish species are restricted to a two-km-long reach from the mouth.

This section is in the town of Visegrád and therefore is especially exposed to human disturbance. Special attention should be paid to the protection and long term maintenance of its fish fauna. The Bükkös Stream is the largest watercourse of the Visegrádi Mountains. Yet, its fish fauna is not so diverse as expected. Flowing through the town of Szentendre the stream becomes heavily polluted. Channelisation significantly decreases the diversity of habitats available for both streamdwelling, resident fish, and the broods of some Danubian fish species. No fish were found in the Malom Stream at Dömös in 1996, the watercourse which had had a relatively diverse fauna earlier. The reason for the total disappearance of fish is unknown. The Lepence Stream was also void of fish, but this result is not surprising. At the mouth there was a big concrete step which completely impeded fish moving upstream in the otherwise concrete channel. The stream had also received occasional chemical pollution from the local wood-mill.

From the streams of the Börzsöny Mountains, relatively detailed fish fauna data exist only on the Kemence (Bernece-Kemence-Csarna streams) and Morgó (Keskenybükki-Lesvölgyi-Verőce-Morgó Streams) waterbasin streams. The fluctuations in fish presence-absence data, however, may be due to the different sampling sites of the different researchers. It would be important to survey these systems again in detail to find the real reason for such small scale changes.

Changes in the fish fauna of the lowland streams and the ponds cannot be followed since only fractional data were found about these waters. An exception is the Sződrákos Stream, where the fish fauna did not have major changes.

From the comparative analysis of the material collected for museological purposes, and the results of fish faunistic surveys, it can be concluded that the waters of the mountains and lowlands of the Danube Bend region are rich in fish species. From a nature conservation viewpoint the fauna contains especially valuable protected, rheophilous and limnophilous fish species in high numbers. The more detailed re-investigation of the region following the rules and standardised methods of monitoring is highly recommended in order to fully understand the possible changes in the fish fauna and the reasons governing this process. It would also help to develop a more detailed picture about the fish fauna of the region. These first, thorough surveys could exclusively make future comparisons of fish communities possible both in space and time. The nature conservation status of the region (national park, biosphere reserve), the general scarcity of research on small waters in Hungary, and increasing human disturbance are among the main reasons that urge the earliest implementation of monitoring.

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